Viking Mission Support

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A previous article identified the probable impact of changes to the scope of the DSN to Flight Project interfaces as far as Viking was concerned. In this article the outcome of the resulting changes is described in the areas of DSN configuration, interfaces, schedules, documentation, and organization in order to establish a background against which subsequent articles can report progress in each of these particular areas.

I. Introduction

Since the beginning of 1972, a substantial effort has been directed toward revising previously existing agreements for support of Viking in the context of the new definition of DSN/Flight Project Interfaces. The probable impact of this new definition was identified in a previous article (Ref. 1).

As a consequence of this effort, all major areas which were affected by the change have now been re-negotiated with the Flight Project, with the Office of Computing and Information Systems (OCIS), and with the DSN Facilities, and new agreements regarding interfaces, documentation, organization configuration, and support have been documented. This article describes the new situation in each of these areas in order to provide a background against which future articles will report continuing progress in DSN support for Viking.

II. Configuration

The DSN configuration for Viking is shown in general terms in Figs. 1 and 2. From a hardware and software point of view, Fig. 1 shows the Deep Space Stations connected via high-speed and wide-band circuits to the GCF Communications Terminal in Building 230 at JPL and then to the Viking Mission Control and Computing Complex in Buildings 230 and 264. This arrangement provides for the direct flow of all telemetry, tracking, and command activity between the DSSs and the Viking Flight Operations System (FOS) located in the Viking Mission Control and Computing Complex (VMCCC).

The DSN operations control function is also located in Building 230 and accesses its supporting data processing function via the GCF Communications Terminal as shown in the figure. The Network Control System (NCS) data processing function may be carried out at some location

yet to be determined other than Building 230. The addition of the NCS to the DSN in no way interferes with the flow of data between the DSSs and VMCCC or vice versa.

From an operations point of view, the DSN configuration for *Viking* appears to the Project as shown in Fig. 2. In this case the NCS operations control function is in series between the FOS and the DSS. All operations traffic to and from the DSSs will pass through this function which acts effectively as the prime operations interface between the DSN and the *Viking* Project. The NCS data processing function provides support to the operations function as described above.

This basically describes the DSN configuration for *Viking*. Detailed configurations at the functional level are presently being developed from these basic concepts in terms of each of the Network systems (telemetry, tracking, command, monitor and operations control, and test and training). These configurations will be described in subsequent reports.

III. Interfaces

The data processing and supporting facilities in Building 230, formerly included in the DSN and called the Space Flight Operations Facility, have now been designated as the Mission Control and Computing Center. In the *Viking* configuration this becomes the *Viking* Mission Control and Computing Center (VMCCC) and was recently established as a sixth system of the *Viking* Project. The other Project Systems are: Launch Vehicle System (LVS), *Viking* Orbiter System (VOS), *Viking* Lander System (VLS), Launch and Flight Operations System (LFOS), and Tracking and Data System (TDS). As a consequence, the TDS interfaces with the *Viking* Project are now defined as shown in Fig. 3. Each of the interfaces is described and controlled by an Interface Requirements Document (IRD), which is signed by the Manager of each of the interfacing systems and approved by the Project Manager. The status of each of these documents is described in *Section V*, below.

IV. Schedules

The *Viking* TDS level 3 schedule is the controlling schedule for all TDS planning in support of *Viking*. The division of responsibility for *Viking* support covered by the previous level 3 schedule, which included the SFOF support, has now been completed. Two level 3 schedules are now approved, one covering TDS support, the other

covering VMCCC support. These schedules are updated monthly and transmitted to the *Viking* Project Office for inclusion in the Project Monthly Review (PMR).

All milestones on the TDS schedule up to the current period have been completed on time. In addition to the level 3 schedule, the TDS is also committed to support the Project-wide PERT (program evaluation and review technique) reporting system. A TDS/PERT network has been developed and is updated twice monthly to reflect TDS activity in the context of Project-level progress.

V. Documentation

As of June 1972, the NASA Support Plan (NSP) for *Viking* has been approved and distributed after being completely revised to reflect the new interfaces.

The Interface Requirements Documents (IRDs) between the DSN Orbiter and DSN/Lander are currently being reviewed prior to final approval.

The DSN/VMCCC IRD is in the early stages of development and, since it is a new concept, will probably require a longer preparation and review cycle.

A new version of the DSN/Project Interface Design Handbook has been issued, which also reflects the change in DSN/Project interfaces.

By agreement with the Project Office, it was decided not to revise the TDS Functional Specification for *Viking* since it no longer matched the DSN organization described in *Section VI*. Instead, a new document called the DSN Support Plan for *Viking* has been created, which better suits the new DSN approach to inform the DSN facilities of the flight project requirements. This document summarizes and brings together all the agreements that have been made in a multitude of Project documents on such matters as configuration control, test and training, documentation, reporting interfaces, DSN capabilities, trouble and failure reporting, reviews, operations support, etc.

The facilities response to this document is in two parts as shown in Fig. 4. The Facilities Mission Preparation Plan responds to the DSN Support Plan with instructions and plans at the facility level for configuration, capability, testing, and schedules related to preparing the facilities for mission support.

The Facilities Mission Operation Plan describes the facility plans for operational support during the mission. These three documents supersede all previous mission-dependent documents and will be formalized in a revision to the DSN documentation system in the near future. The DSN Support Plan is undergoing final review at this time, while the facility responses are still in the early formative stages.

VI. Organization

The change in DSN responsibilities referred to above together with general consolidation of DSN manpower resources resulted in the deletion of the DSN Project Engineer function. The DSN Manager and Project Engineer functions are now combined, and as a consequence a new approach to DSN/Facility working relationships is required. The previous concept of a Capabilities Planning Team (CPT) has been dissolved and replaced with a DSN Support Team chaired by the DSN Manager and composed of an engineering and an operations representative from each of the facilities.

This team continues to exist for the life of the Project and provides continuous support from the planning phase through implementation, test, and operations. It is believed that this will afford a closer tie between the facilities implementation and operations support and the DSN commitments to the Project than we have had in the past.

The DSN Support Team for *Viking* has been established and has been in operation for several months. The team members are:

Chairman	D. J. Mudgway DSN Manager for *Viking*
DSIF Engineering	W. D. Brown
DSIF Operations	D. W. Johnston
GCF Engineer	J. P. McClure
GCF Operations	J. W. Capps
Network Central System	W. J. Kinder
DSN Operations	R. J. Amorose
Viking Project Representative	R. R. Peterson
VMCCC Representative	E. L. Pyle

Formal minutes of its regular meetings are prepared for a wide distribution throughout the Project and DSN.

VII. Conclusion

Most of the disruptions caused by the change in DSN/Flight Project interfaces have now been resolved and new and, in many cases, better interfaces and working relationships have been developed and put into effect. The DSN is now proceeding in the new environment described above, and progress toward *Viking* mission readiness will be reported in this context in subsequent issues.

Reference

1. Mudgway, D. J., "*Viking* Mission Support," in *The Deep Space Network Progress Report*, Technical Report 32-1526, Vol. VIII, pp. 20-23. Jet Propulsion Laboratory, Pasadena, Calif., Apr. 15, 1972.
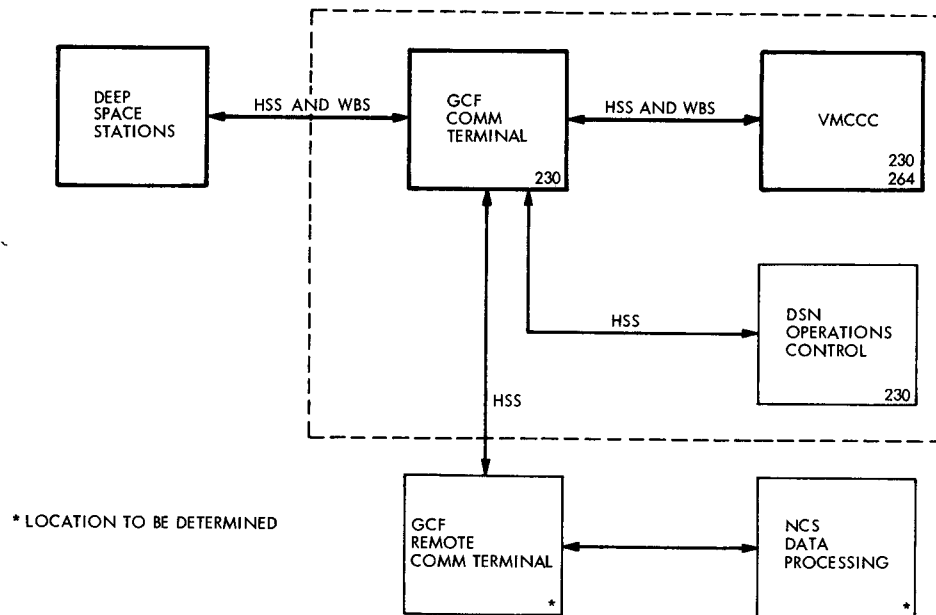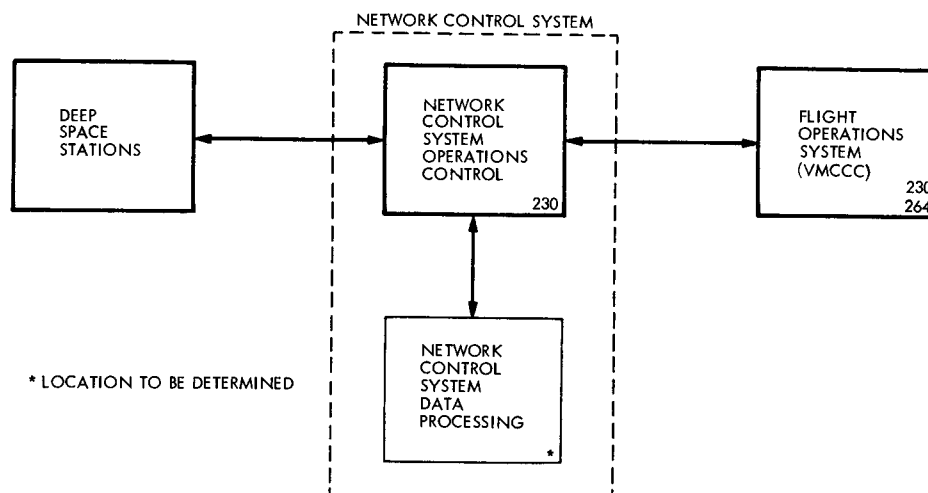
Fig. 1. DSN general hardware configuration

* LOCATION TO BE DETERMINED

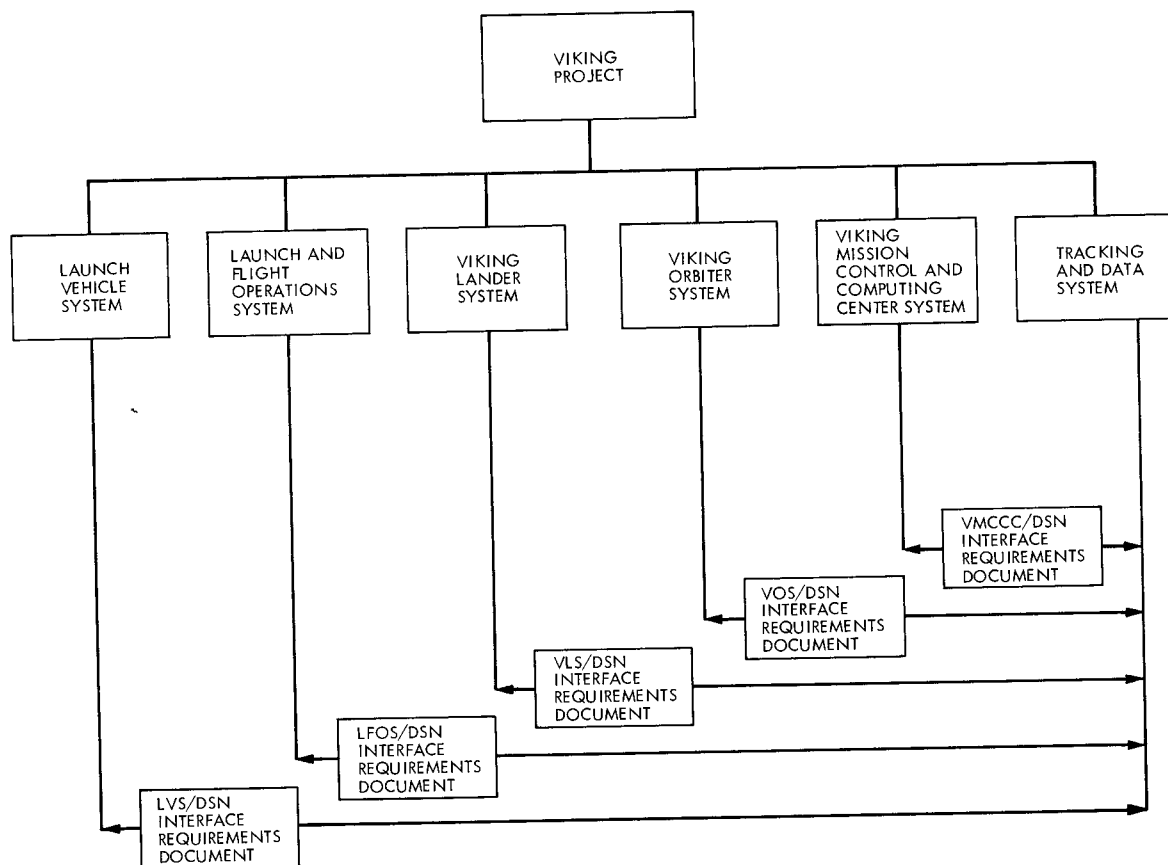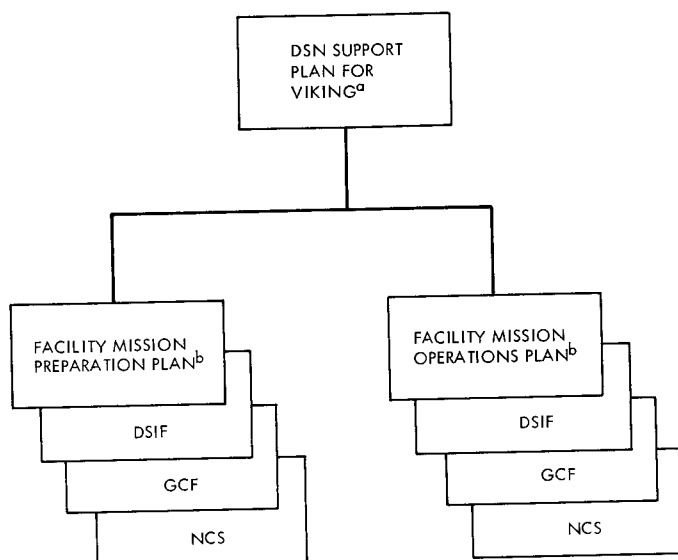

Fig. 2. DSN general operations configuration

Fig. 3. TDS interfaces within *Viking* Project

a PREPARED BY DSN MANAGER

b PREPARED BY FACILITIES MANAGERS

Fig. 4. DSN/Facilities documentation for *Viking*